

## Identification Of Element

1 What is the total number of neutrons in an atom of K-42?

- (1) 19 (3) 23  
(2) 20 (4) 42

2 Compared to an atom of C-12, an atom of C-14 has a greater

- (1) number of electrons (3) atomic number  
(2) number of protons (4) mass number

3 Which two notations represent isotopes of the same element?

- (1)  $^{14}_7\text{N}$  and  $^{18}_7\text{N}$  (3)  $^{14}_7\text{N}$  and  $^{17}_{10}\text{Ne}$   
(2)  $^{20}_7\text{N}$  and  $^{20}_{10}\text{Ne}$  (4)  $^{19}_7\text{N}$  and  $^{16}_{10}\text{Ne}$

4 Which notations represent hydrogen isotopes?

- (1)  $^1_1\text{H}$  and  $^2_1\text{H}$  (3)  $^1_2\text{H}$  and  $^1_3\text{H}$   
(2)  $^1_1\text{H}$  and  $^4_2\text{H}$  (4)  $^2_1\text{H}$  and  $^7_2\text{H}$

5 Which particle has two neutrons?

- (1)  $^1_0\text{n}$  (3)  $^2_1\text{H}$   
(2)  $^1_1\text{H}$  (4)  $^4_2\text{He}$

6 Each diagram below represents the nucleus of an atom.



How many different elements are represented by the diagrams?

- (1) 1 (3) 3  
(2) 2 (4) 4

7 All atoms of uranium have the same

- (1) mass number  
(2) atomic number  
(3) number of neutrons plus protons  
(4) number of neutrons plus electrons

8 All phosphorus atoms have the same

- (1) atomic number  
(2) mass number  
(3) number of neutrons plus the number of electrons  
(4) number of neutrons plus the number of protons

9 Which notations represent different isotopes of the element sodium?

- (1)  $^{32}\text{S}$  and  $^{34}\text{S}$  (3)  $\text{Na}^+$  and  $\text{Na}^0$   
(2)  $\text{S}^{2-}$  and  $\text{S}^{6+}$  (4)  $^{22}\text{Na}$  and  $^{23}\text{Na}$

Base your answers to questions 10 on the information below and on your knowledge of chemistry.

The four naturally occurring isotopes of sulfur are S-32, S-33, S-34, and S-36. The table below shows the atomic mass and percent natural abundance for these isotopes.

Naturally Occurring Isotopes of Sulfur

Isotope	Atomic Mass (u)	Natural Abundance (%)
S-32	31.972	94.99
S-33	32.971	0.75
S-34	33.968	4.25
S-36	35.967	0.01

10 State both the number of protons and the number of neutrons in an S-33 atom.

Base your answers to questions 11 on the information below and on your knowledge of chemistry.

The only naturally occurring isotopes of nitrogen are N-14 and N-15.

11 State the number of protons in an atom of N-15.

Base your answers to questions 12 on the information below and on your knowledge of chemistry.

When uranium-235 nuclei are bombarded with neutrons, many different combinations of smaller nuclei can be produced. The production of neodymium-150 and germanium-81 in one of these reactions is represented by the equation below.

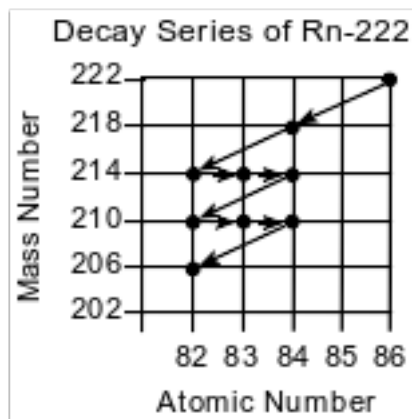


Germanium-81 and uranium-235 have different decay modes. Ge-81 emits beta particles and has a half-life of 7.6 seconds.

12 State the number of protons and number of neutrons in a neodymium-150 atom.

Base your answers to questions 13 on the information below and on your knowledge of chemistry.

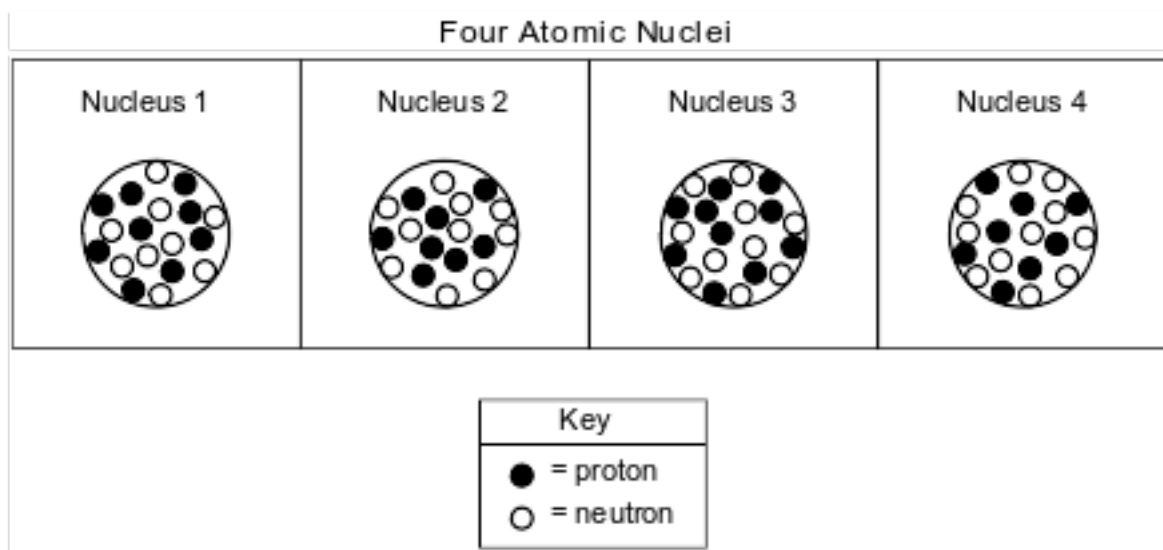
The isotope Rn-222 is produced by the decay of uranium in Earth's crust. Some of this isotope leaks into basements of homes in areas where the ground is more porous. An atom of Rn-222 decays to an atom of Pb-206 through a series of steps as shown on the graph below.



13 Determine the number of neutrons in an atom of Pb-214.

Base your answers to questions 14 on the information below and on your knowledge of chemistry.

The diagrams below represent four different atomic nuclei.



14 Determine the mass number of the nuclide represented by nucleus 2.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

The radioisotope Mo-99 naturally decays to produce the metastable isotope Tc-99m, which is used in medical diagnosis. A doctor can obtain images of organs and bones by injecting a patient with a solution of Tc-99m. The half-life of the metastable Tc-99m is six hours.

15 State both the number of protons and the number of neutrons in a Tc-99 nuclide.

## Answer Keys

1 3

2 4

3 1

4 1

5 4

6 2

7 2

8 1

9 4

10 Allow 1 credit for 16 protons and 17 neutrons.

11 Allow 1 credit for 7 or seven.

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- Protons: 60
- Neutrons: 90

13 Allow 1 credit for 132.

14 Allow 1 credit for 18.

15 Allow 1 credit for 43 protons and 56 neutrons.